INFORMATION BULLETIN

PUBLIC HEARING

on a

PROPOSED REVISION

of

WATER QUALITY STANDARDS

and

WATER USE CLASSIFICATIONS

for

MONTANA

by

THE MONTANA WATER POLLUTION CONTROL COUNCIL

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INTRODUCTION

In 1952, the Pollution Control Council, Pacific Northwest Area, of which Montana is a member, in order to more adequately describe the quality of water necessary for its various uses, adopted Water Quality Objectives, which were proposed to the member agencies as a guide to use in the development of water pollution programs based on the concept of water use. With some modifications, such as the deletion of material relating to marine waters, the Montana Water Pollution Council adopted these objectives as "Stream Criteria for Waste Discharges" in February, 1956. These criteria served the purposes of the Council quite adequately; however, it has become apparent with the rapid advance in water pollution control technology that some parts of the criteria were in need of revision and modernization. At an October, 1964, meeting of the Pacific Northwest Pollution Council, it was agreed by the members that a revision of that group's water quality objectives was needed. Consequently, a subcommittee was appointed to review and update the objectives. After several reports of the subcommittee during the subsequent two years, a revision of the objectives was adopted by the Pacific Northwest Pollution Council during August, 1966. Coincidental with the Pacific Northwest group's consideration, the Federal Water Quality Act of 1965 was passed requiring all of the states to adopt water quality criteria for interstate waters and a plan for implementing and enforcing these criteria. The Federal act further provides that the standards adopted by a state will become applicable if:

(1) The Governor or Water Pollution Control Agency files by October 2, 1966 a letter of intent that the state, after public hearings, will before June 30, 1967, adopt

   (a) water quality criteria applicable to interstate waters or portions thereof within the state, and

   (b) a plan for the implementation and enforcement of the criteria; and,

(2) the state subsequently adopts such criteria and plans; and,

(3) the Secretary determines that the state criteria and plan are consistent with the purposes of the Act, that is "to enhance the quality and value of our water resources and to establish a national policy for the prevention, control, and abatement of water pollution."

Although Montana had water quality criteria in effect at that time, a letter of intent to adopt (or revise) these criteria, was filed with the Secretary of Interior during May, 1966. The Montana State Department of Health, designated by law as the administrator of the Montana Water Pollution Act of 1955, initiated a review of the present water quality criteria and water use classifications based primarily on the Pacific Northwest Pollution Council's revised objectives for the purpose of updating the existent criteria. This bulletin includes the proposed revision of the criteria which was tentatively adopted by the Water Pollution Council during February, 1967. A proposed water use classification revision is also included and the bulletin is intended to be

the Water Quality Standards of 1967 for Montana as required by the Federal Water Pollution Control Administration, United State Department of the Interior. (The Water Quality Standards referred hereafter are defined as the Water Quality Criteria, Water Use Classifications, Implementation and Enforcement Plan as a single package).

As required by Montana law and by the Federal Act, these standards are being presented at this public hearing for consideration and comment by the major water users of the state of Montana. Testimony received at public hearings will be reviewed by the Montana Water Pollution Council and, based upon its applicability, will be incorporated into the Standards, which will then be adopted by the Council as a guide to the administration of the Montana Water Pollution Act of 1955.

Montana adopted an effective water pollution control law in 1955. This comprehensive law covered prevention, control and abatement of water pollution. Before this, the first water pollution control legislation, adopted in 1907, had as its primary purpose, the protection of domestic water supplies.

The 1955 legislation established a seven-member state water pollution council, whose duties included adopting water quality standards and classifying the streams in the state on the basis of their most beneficial uses. This has been done.

In order to classify the streams, studies were made of the various watercourses to determine their then existing condition. The first streams were classified in 1958 beginning with the Yellowstone River, followed by the Clark Fork, Flathead and Kootanai drainages, and the Missouri River and tributaries in 1960. The last drainage area to be classified was that portion draining into Hudson Bay in Canada. This is a small area without any municipalities and it was classified in 1966.

The classification recognizes the following uses: domestic water supply, swimming, recreation, fish and wildlife, agriculture, and industrial. The legislation delegates policy making to the Water Pollution Council and designates the State Department of Health as the administrative agency. This was done to keep costs at a minimum since the staff of the State Department of Health was well trained and experienced in municipal and industrial waste treatment.

Since 1955, there have been 107 new sewage treatment plants or major additions to existing treatment plants constructed in Montana. Of 440,000 people served by sewers in Montana, 419,000 have facilities that meet the minimum requirements of primary treatment and effective disinfection of sewage (or lagoon treatment) as established by the Montana Water Pollution Council. While all communities that are sewered have some type of sewage treatment, improvements are needed on some existing plants. Planning is now underway for this up-dating at the majority of the plants. Four semi-public sewer systems do not have treatment but are developing preliminary plans for such. Montana communities have spent over $8,700,000 for sewage treatment facilities since 1955 and an additional $3,600,000 has been provided through Federal grants. During the same period, industries have spent an even

greater sum to treat their wastes and while the industries are doing a very commendable job with their waste treatment in most areas, there is need for additional facilities in some industries.

With the passage of the 1955 water pollution legislation, there have been many improvements in the streams of the state. An outstanding example is the Clark Fork River between Warm Springs and Missoula where the mine and smelter wastes have been removed. This stream has become one of the fine fishing streams in Montana and is an attraction both for our citizens and those that may be visiting.

Seventy-five communities have received federal grants to assist with the construction of treatment facilities; however, some communities and all Montana industries have financed their own water pollution abatement programs. The State Board of Health issued eight orders to install or improve waste treatment. The communities apparently found this action sufficient incentive, and it was not necessary to take any cases to court. Primarily, pollution control facilities have been obtained by informing the people in the communities as to what was needed, why it was necessary and then providing guidance so that they could improve treatment. Montanans' cooperation has been excellent.

The work in Montana has been carried out with a minimum budget. The state has appropriated approximately $36,000 per year and the federal government has supplied an additional $24,000 per year. This has been supplemented by the Fish and Game Department, who has provided a biologist to work with the staff members. The staff consists of four full-time and two part-time employees, plus secretarial help and laboratory facilities.

With the treatment facilities that have been constructed by our municipalities and industries, it is necessary that the plants be properly operated. The 1967 legislative assembly passed legislation requiring mandatory certification of all operators in responsible charge of plants. This will do much toward providing properly trained operators and will further insure that the stream classifications are met.

PUBLIC POLICY

The 1955 Montana Water Pollution Act states, in part, "It is the public policy of this state to:

> (a) conserve water by protecting, maintaining, and improving the quality and potability of water for public water supplies, wildlife, fish and aquatic life, agriculture, industry, recreation, and other beneficial uses."

The Water Quality Act of 1965 establishes Federal policy as, "The purpose of this Act is to enhance the quality and value of our water resources to establish a national policy for the prevention, control, and abatement of water pollution."

Consistent with these policies are the Federal Guidelines for establishing water quality standards for the interstate waters of Montana. Briefly, these guidelines are as follows:

"1. Water quality standards should be designed to 'enhance the quality of water.' If it is impossible to provide for prompt improvement in water quality at the time initial standards are set, the standards should be designed to prevent any increase in pollution. In no case will standards providing for less than existing water quality be acceptable.

"2. No standards of water quality will be approved which provide for the use of any stream or portion thereof for the sole or principal purpose of transporting wastes.

"3. Water quality criteria should be applied to the stream or other receiving water or portions thereof. The criteria should identify the water uses to be protected and establish limits on pollutants or effects of pollution necessary to provide for such uses. Numerical values should be stated for such quality characteristics where such values are available. Where appropriate, biological or bioassay parameters may be used. In the absence of appropriate numerical values or biological parameters, criteria should consist of verbal descriptions in sufficient detail as to show clearly the quality of water intended (e.g., 'substantially free from oil').

"4. The measure of time period and limiting values which will govern for purposes of the criteria should be defined (e.g., annual arithmetric mean concentration, single daily maximum concentration). Where appropriate, the specified recurrence and duration of the accepted design streamflow should be defined (e.g., 25-year recurrence of minimum lowflow of 10-day duration).

"5. Water quality criteria should be accompanied by a description of present water quality and uses, together with uses expected in the future and the water quality required to make those uses possible. The water quality standards proposed by a State should provide for:

(a) Potential and future water uses as well as the present intended use and uses;

(b) The upgrading and enhancement of water quality and the use or uses of streams or portions thereof that are presently affected by pollution;

(c) The maintenance and protection of quality and use or uses of waters now of a high quality or of a quality suitable for present and potential future uses.

"6. The plan for implementing and enforcing the water quality criteria should be submitted in sufficient detail to describe the nature of the actions to be taken to achieve compliance, a time schedule for such compliance, the controls and surveillance for measuring compliance, and the enforcement authority and measure for ensuring compliance. Achievement of the purposes of the Act is paramount.

"7. The plan should include consideration of all relevant pollutional sources, such as municipal and industrial wastes, cooling water discharges, irrigation return flows, and combined sewer overflows.

"8. No standard will be approved which allows any wastes amenable to treatment or control to be discharged into any interstate water without treatment or control regardless of the water quality criteria and water use or uses adopted. Further, no standard will be approved which does not require all wastes, prior to discharge into any interstate water, to receive the best practicable treatment or control unless it can be demonstrated that a lesser degree of treatment or control will provide for water quality enhancement commensurate with proposed present and future water uses.

"9. Public hearings are required to be held by States establishing standards in accordance with the provisions of the Act.

"10. State standards will be reviewed in terms of their consistency and comparability with those for affected waters of downstream or adjacent States. Coordination is encouraged among States to assure such consistency.

"11. The use or uses of the waters concerned, the water quality criteria to provide for such use or uses, and the plan for implementing the water quality criteria should be in conformity with any comprehensive water pollution control program developed pursuant to Section 3 of the Federal Water Pollution Control Act, as amended; should encompass any remedial program recommended by the Secretary as a result of an enforcement action taken under Section 10 of the Act; and should be revised to reflect any recommendations resulting as such programs and actions develop.

"12. To meet the goals established by the Act, water quality standards must be adequate to protect and upgrade water quality in the face of population and industrial growth, urbanization, and technological change. In accordance with the provisions of the Act, it is anticipated that after the initial setting of standards, periodic review and revision will be required to take into account changing technology of waste production and waste removal and advances in knowledge of water quality requirements developed through research."

PROPOSED STANDARDS

Experience with the water quality criteria adopted in 1956 (Table 1) has amply demonstrated the consideration of water use as the basic principle for any pollution control program. It soon became apparent in applying these criteria that violation of any one, or even more, of the water quality characteristics did not necessarily constitute, in itself, damage to a water use. A most obvious example of this would be the high coliform values found during the spring runoff. Although, technically, the limits for coliform organisms are generally exceeded during runoff periods because of the presence of coliform organisms originating from the soil, the public health significance of this concerning Class C (bathing, swimming and recreational) uses is quite unimportant; since, for the most part, people are not swimming during this period of the year and the coliforms are not indicative of sewage. Use of these criteria has further demonstrated that some water quality characteristics can be more specifically described; other parts proved

Table 1.

STREAM CRITERIA FOR WASTE DISCHARGES

WATER QUALITY CRITERIA AND MINIMUM TREATMENT REQUIREMENTS FOR MONTANA SURFACE AND UNDERGROUND WATERS

WATER QUALITY WATER USES	ORGANISMS OF THE COLIFORM GROUP	FLOATING SUSPENDED SETTLEABLE SOLIDS AND SLUDGE DEPOSITS	ASSIMILATABLE PRODUCING SUBSTANCES	DISSOLVED OXYGEN	pH	TOXIC, COLORED, OR OTHER DELETERIOUS SUBSTANCES	PHENOLIC COMPOUNDS	OIL	HIGH TEMPERATURE WASTES	MINIMUM TREATMENT REQUIREMENTS FOR DOMESTIC SEWAGE
(A) WATER SUPPLY, DRINKING, CULINARY, AND FOOD PROCESSING. Without treatment other than simple disinfection and removal of naturally present impurities.	Most probable number (MPN) coliform bacterial content of a representative number of samples should average less than 50 per 100 ml. in any month.	None attributable to sewage, industrial wastes, or other wastes or which, after reasonable dilution and mixture with receiving waters, interfere with the best use of these waters for the purpose indicated.	None attributable to sewage, industrial wastes or other wastes.	Greater than five (5) parts per million, except for underground waters.	Hydrogen ion concentration expressed as pH should be maintained between 6.5 and 8.5	None alone or in combination with other substances or wastes in sufficient amounts or of such nature as to make receiving water unsafe for use indicated for use indicated (U. S. P. H. S. Std.)	Less than five (5) parts per billion	None	Not in sufficient quantities alone or in combination with other wastes to interfere with the use indicated.	Primary treatment and effective disinfection except in special cases as determined by the State Board of Health. Sewage lagoon treatment will meet this requirement.
(B) WATER SUPPLY, DRINKING, CULINARY, AND FOOD PROCESSING. With treatment equal to coagulation, sedimentation, filtration, disinfection, and any additional treatment necessary for removing naturally present impurities	MPN coliform bacterial content of a representative number of samples should average less than 2000 per 100 ml. and should not exceed this number in more than 20 percent of samples examined in any month where associated with domestic sewage.	(Same as for use "A" above).	None attributable to sewage, industrial wastes or other wastes which, after reasonable dilution and mixture, will increase the threshold odor number above eight (8).	Same as for use "A" above.	Same as for use "A" above.	Same as for use "A" above.	Same as for use "A" above.	None detectable	Same as for use "A" above.	Same as for use "A" above.
(C) BATHING, SWIMMING, AND RECREATION. Note: When waters are used for recreational purposes such as fishing and boating, exclusive of bathing and swimming, the number "1000" may be substituted for "240" in statement of coliform objectives.	MPN coliform bacterial content of a representative number of samples should average less than 240 per 100 ml. and should not exceed this number in more than 20 percent of samples examined in any month where associated with domestic sewage.	Same as for use "A" above.	None attributable to sewage, industrial wastes or other wastes which, after reasonable dilution and mixture, will interfere with the best use of these waters for the purpose indicated.	Greater than five (5) parts per million.	Same as for use "A" above.	Same as for use "A" above.	Less than twenty five (25) parts per billion or none in sufficient amounts as to impart a residual taste to recreational or commercial fish or other aquatic forms	Same as for use "D" above.	Same as for use "A" above.	Same as for use "A" above.
(D) GROWTH AND PROPAGATION OF FISH AND OTHER AQUATIC LIFE. Including waterfowl, furbearers, and other aquatic and semi-aquatic life.	See note under "C" above.	Same as for use "A" above.	None attributable to sewage, industrial wastes or other wastes which will interfere with the palatability or propagation of recreational or commercial fish or other edible aquatic forms.	Same as for use "C" above.	Same as for use "A" above.	None alone or in combination with other substances or wastes in sufficient amount or of such character as to make receiving waters unsafe or unsuitable for use indicated.	Same as for use "C" above.	Same as for use "D" above	Not in sufficient quantity as to increase the temperature of the receiving water beyond that optimum for the normal aquatic life of the specific water.	Primary treatment and effective disinfection. Sewage lagoon treatment will meet this requirement.
(E) AGRICULTURAL AND INDUSTRIAL WATER SUPPLY Without treatment except for the removal of natural impurities to meet special quality requirements other than those classified under "A" above. Note: Permissible limits for total concentration percent sodium, boron, chlorides, and sulphates to receive further study, suggested value for percent sodium is less than 60. Percent sodium computed as the ratio of sodium to total cations expressed in equivalent weights. Calculated from the formula: Na X 100 ÷ Na + K + Ca + Mg when Na, Ca, K, and Mg are expressed in equivalents.		Same as for use "A" above	None attributable to sewage, industrial wastes or other wastes which will adversely affect the marketability of agricultural or industrial produce.	Greater than three (3) parts per million.	Hydrogen ion concentration expressed as pH should be maintained between 6.0 and 9.5	Same as for use "A" above.	None in sufficient quantity as to make receiving water unsuitable for use indicated.	Same as for use "B" above	Same as for use "A" above.	Same as for use "D" above.

Water Quality Objectives of a watercourse will apply at the point of discharge of a waste except in special cases where the sampling points will be determined by the Montana Water Pollution Council.

Determinations in the above table will be in accordance with "Standard Methods for the Examination of Water, Sewage and Industrial Wastes".

Adopted tentatively Feb. 28, 1956
Revised April, 1958
Reviewed Sept. 2, 1958

to be somewhat cumbersome in application; some characteristics were entirely lacking; and some could be combined under more general headings.

Since we are concerned with water quality criteria as applied to receiving waters, the regulation established by the Council reading, "Water quality objectives of a water course will apply at the point of discharge of a waste, except in special cases where the sampling points will be determined by the Montana Water Pollution Council," (Table 1) is not applicable in a general sense to stream or receiving water criteria. The proposed criteria include an attempt to clarify this by stating, "Applicable after reasonable opportunity for discharges to mix with receiving waters as determined by the Montana Water Pollution Council" (Table 2).

The proposed criteria have retained columns for "Organisms of the Coliform Group," "Dissolved Oxygen," "Hydrogen Ion Concentration (pH)" and "Toxic or Other Deleterious Substances." The heading for "High Temperature Wastes" has been changed to "Temperature" since cold water taken from the bottom of large reservoirs may damage fisheries use. The column entitled "Floating, Suspended, Settleable Solids and Sludge Deposits" in the 1956 criteria has been divided into three areas of consideration; namely, "Turbidity," "Residues," and "Sediment or Settleable Solids." Those columns dealing with "Taste or Odor Producing Substances," "Phenolic Compounds," and "Oil" as separate entities, have, for the most part, been combined in the new columns under "Residues" and "Aesthetic Considerations." A column for "Radioactivity" has been added to the proposed criteria.

In order that water users can more thoroughly understand the reasons behind the proposed water quality criteria, a short discussion of each proposed water quality characteristic is presented. Again, it is impossible to discuss these criteria without considering water use; therefore, water quality criteria are considered by uses.

Organisms of the Coliform Group

The direct search for the presence of a specific pathogen in water is too uneconomical, slow, and unwieldy for routine control purposes. Instead, water is examined for an indication of fecal contamination, and, when such indication is found, it is assumed that the water is potentially dangerous.

Several chemical and bacteriological tests for sewage contamination have been tried and found inadequate; however, the demonstration of the presence of coliform organisms in a water sample is regarded as evidence of such contamination and has served for many years as a basis for water-quality criteria. The coliform group of organisms includes, by definition, "all aerobic and facultative anaerobic, Gram-negative, nonspore-forming, rod-shaped bacteria that ferment lactose with gas formation within 48 hours at 35° C." It embraces organisms of diverse origin among which the best known are Escherichia coli strains, which are primarily of fecal origin, and Aerobacter aerogenes, which are primarily of soil, vegetable, or other non-fecal origin. Recent investigations strongly indicate that the portion of the coliform group which is present in the gut or the feces of warm-blooded animals generally included organisms which are capable of producing

APPROVED BY THE MONTANA WATER POLLUTION CONTROL COUNCIL APRIL 13, 1967

TABLE 1. PROPOSED WATER QUALITY CRITERIA

APPLICABLE AFTER MAXIMUM OPPORTUNITY FOR DILUTION TO MIX WITH RECEIVING WATERS, AS DETERMINED BY THE MONTANA WATER POLLUTION CONTROL COUNCIL

NOTE: QUALITATIVE AND QUANTITATIVE EVALUATION OF WATER SAMPLES FOR COMPARISON WITH THESE CRITERIA SHOULD BE MADE IN ACCORDANCE WITH PROCEDURES SET FORTH IN THE LATEST EDITION OF "STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATERS", AMERICAN PUBLIC HEALTH ASSOCIATION, AMERICAN WATER WORKS ASSOCIATION, AND WATER POLLUTION CONTROL FEDERATION, 1965.

WATER QUALITY CRITERIA WATER USES	DISSOLVED OXYGEN (MG/L) MINIMUM (MPM) OR EQUIVALENT PERCENT SATURATION AT SAMPLING TEMPERATURE AND CORRECTED FOR VARIATIONS DUE TO BAROMETRIC PRESSURE.	pH INDICATED VARIATION WITHIN RANGES LISTED SHALL BE LESS THAN 0.5 pH UNIT. NATURAL pH OUTSIDE RANGE SHALL BE MAINTAINED WITHOUT CHANGE AND NATURAL pH ABOVE 7.0 SHALL BE MAINTAINED ABOVE 7.0.	TURBIDITY JACKSON CANDLE UNITS (JCU) LISTED LIMITS SHALL BE ALLOWABLE IN ADDITION TO NATURAL TURBIDITY	TEMPERATURE (°F) ALLOWABLE CHANGES IN ELEVATING WATER TEMPERATURE. WHERE CHANGE TO NATURAL OR INDUCED WATER USE CANNOT BE PREDICTED OR DETERMINED, A GREATER RANGE OF INDUCED CHANGE WILL BE ALLOWED.	RESIDUES OILS, FLOATING SOLIDS, AND SLUDGE DEPOSITS.	SEDIMENT OR SETTLEABLE SOLIDS SHALL NOT BE INCREASED ABOVE THAT CONCENTRATION NATURALLY PRESENT.	TOXIC OR OTHER DELETERIOUS SUBSTANCES, PESTICIDES AND RELATED ORGANIC AND INORGANIC AND METALLIC INCLUDING ESSAY METAL COMPOUNDS. (EXCEPTIONS FOR BENEFICIAL PURPOSES MAY BE AUTHORIZED BY THE MONTANA WATER POLLUTION CONTROL COUNCIL)	RADIOACTIVITY (LIMITS LISTED SHALL INCLUDE NATURAL BACKGROUND) CONCENTRATIONS OF RADIOACTIVE MATERIALS SHALL CONFORM WITH THE 1962 U.S. PUBLIC HEALTH SERVICE DRINKING WATER STANDARDS.	AESTHETIC CONSIDERATIONS NOT COVERED UNDER OTHER WATER QUALITY CRITERIA. WASTES OFFENSIVE TO THE SENSES OF SIGHT, TOUCH, SMELL, OR TASTE, INCLUDING PRONOUNCED COLOR. NO EVIDENCE OF WASTES OTHER THAN THAT FROM NATURAL ORIGIN EXCEPT THROUGH CONFORMING AND REAL COLOR SHALL NOT EXCEED 0.001 ml/l AND TWO UNITS, RESPECTIVELY, ABOVE NATURALLY OCCURRING CONCENTRATIONS.
A. WATER SUPPLY FOR DRINKING, CULINARY, AND FOOD PROCESSING PURPOSES, SUITABLE FOR USE WITHOUT TREATMENT OTHER THAN SIMPLE DISINFECTION AND REMOVAL OF NATURALLY PRESENT IMPURITIES.	AVERAGE LESS THAN 90 PER 100 MILLILITERS (90/100 ML). GREATER THAN 75 PERCENT.	BETWEEN 6.5 & 8.5	NO INCREASE SHALL BE ALLOWED.	TWO DEGREES UP TO A RECEIVING WATER TEMPERATURE OF 67 DEGREES F (0.5) DEGREE ABOVE 67.	NONE DETECTABLE (SEE NOTE) IN ADDITION TO CONCENTRATIONS NATURALLY PRESENT. NO VISIBLE CONCENTRATIONS OF WOOD FIBERS, OIL, SLUDGE, SEWAGE, SCUM, FOAM, OR OTHER WASTES.	SHALL NOT BE INCREASED ABOVE THAT CONCENTRATION NATURALLY PRESENT.	CHEMICAL CONSTITUENTS SHALL CONFORM WITH THE 1962 U.S. PUBLIC HEALTH SERVICE DRINKING WATER STANDARDS. INDUCED VARIATIONS WITHIN THESE STANDARDS SHALL BE LIMITED TO AN INCREASE OF NOT MORE THAN 10 PERCENT OF THE CONCENTRATIONS PRESENT IN THE RECEIVING WATERS.	CONCENTRATIONS OF RADIOACTIVE MATERIALS SHALL CONFORM WITH THE 1962 U.S. PUBLIC HEALTH SERVICE DRINKING WATER STANDARDS.	
B. WATER SUPPLY FOR DRINKING, CULINARY, AND FOOD PROCESSING PURPOSES, SUITABLE FOR USE WITH ADEQUATE TREATMENT EQUAL TO COAGULATION, SEDIMENTATION, FILTRATION, DISINFECTION, AND ANY ADDITIONAL TREATMENT NECESSARY TO REMOVE NATURALLY PRESENT IMPURITIES.	AVERAGE LESS THAN 2000/100 ML WITH NOT MORE THAN 20 PERCENT OF THE SAMPLES EXCEEDING 5000/100 ML DURING THE 30-DAY PERIOD. GREATER THAN 60 PERCENT.	BETWEEN 6.5 & 9.5.	NO IMPOSED VALUES WILL INTERFERE WITH ESTABLISHED LEVELS OF TREATMENT.	TWO DEGREES UP TO A RECEIVING WATER TEMPERATURE OF 84° (68-HALF (0.5) DEGREE ABOVE 84.	(SAME AS A)	NO IMPOSED VALUES WILL INTERFERE WITH THE ESTABLISHED LEVELS OF TREATMENT.	CHEMICAL CONSTITUENTS SHALL CONFORM WITH THE 1962 U.S. PUBLIC HEALTH SERVICE DRINKING WATER STANDARDS.	(SAME AS A)	NO EVIDENCE OF WASTES CREATING NUISANCE CONDITIONS OTHER THAN THAT FROM NATURAL ORIGIN EXCEPT THROUGH CONFORMING AND REAL COLOR SHALL NOT EXCEED 0.005 ml/l AND FIVE UNITS, RESPECTIVELY, ABOVE NATURALLY OCCURRING CONCENTRATIONS.
C. BATHING, SWIMMING, AND RECREATION.	AVERAGE LESS THAN 1000/100 ML WITH NOT MORE THAN 20 PERCENT OF THE SAMPLES EXCEEDING 2400/100 ML DURING THE 30-DAY PERIOD.	(SAME AS B)	(SAME AS B)	TEN (10) JCU.	(NOT APPLICABLE)	(SAME AS A)	NONE IN SUFFICIENT QUANTITIES TO AFFECT THE SUITABILITY INDICATED.	CONCENTRATIONS SHALL BE KEPT BELOW LEVELS KNOWN TO BE (OR FOUND TO BE) OF PUBLIC HEALTH SIGNIFICANCE.	(SAME AS A)	NO FLOATING, SUSPENDED, OR SETTLEABLE MATTER, CREATING NUISANCE CONDITIONS, NOT ATTRIBUTABLE TO NATURAL CAUSES. REAL COLOR SHALL NOT EXCEED FIVE UNITS ABOVE NATURALLY OCCURRING COLOR.
D. GROWTH AND PROPAGATION OF SALMONID FISHES AND ASSOCIATED AQUATIC LIFE, WATERFOWL, AND FURBEARERS.	(SAME AS C)	THE PERCENTAGE SATURATION OF DISSOLVED OXYGEN SHALL BE MAINTAINED WITHIN FIVE (5) PERCENT OF NATURALLY OCCURRING CONDITIONS DURING THE DIURNAL AND SEASONAL LOW.	(SAME AS A)	FIVE (5) JCU	(SAME AS A)	(SAME AS A)	(SAME AS A)	LESS THAN ACUTE OR CHRONIC PROBLEM LEVELS AS REVEALED BY BIOASSAY OR OTHER APPROPRIATE METHODS. IN ADDITION: PESTICIDES: ORGANOCHLORINE (0.1) OF THE TLm 96 FOR SHORT RESIDUAL PERSISTALS AND ORG-ANOPHOSPHATES (0.01) OF THE TLm 96 FOR SUBSTANCES EXHIBITING A RESIDUAL LIFE EXCEEDING 30 DAYS IN WATER.	SAME AS A, EXCEPT WHERE CONCENTRATION FACTORS OF AQUATIC FLORA AND FAUNA EXCEED THE RECOMMENDED REDUCTION FACTORS, THEN MAXIMUM PERMISSIBLE LIMITS SHALL BE REDUCED BELOW ACUTE OR CHRONIC PROBLEM LEVELS.	NO FLOATING, SUSPENDED OR SETTLEABLE MATTER, CREATING NUISANCE CONDITIONS, NOT ATTRIBUTABLE TO NATURAL CAUSES. NO EVIDENCE NATURALLY OCCURRING CAUSE NUISANCE AESTHETIC GROWTHS. PRONOUNCED AND RELATED TASTE & ODOR CAUSING MATERIALS SHALL NOT EXCEED LEVELS WHICH CAUSE TAINTING OF THE FLESH OF EDIBLE SPECIES. REAL COLOR SHALL NOT EXCEED FIVE UNITS ABOVE NATURALLY OCCURRING COLOR
D2. GROWTH AND PROPAGATION OF NON-SALMONID FISHES AND ASSOCIATED AQUATIC LIFE, WATERFOWL, AND FURBEARERS. GROWTH OF SALMONID FISHES.	(SAME AS B)	GREATER THAN 75 PERCENT OF SATURATION AT THE DIURNAL AND SEASONAL LOW. IN ADDITION, 90 PERCENT OF SATURATION DURING PERIODS OF SPAWNING THROUGH THE SWIM-UP FRY STAGES OF DEVELOPING EGGS AND FRY.	(SAME AS B)	TEN (10) JCU	(SAME AS B)	(SAME AS A)	(SAME AS A)	(SAME AS D_1)	(SAME AS D_1)	SAME AS D_1 EXCEPT, REAL COLOR SHALL NOT EXCEED 15 UNITS ABOVE NATURALLY OCCURRING COLOR.
E. AGRICULTURAL WATER SUPPLY INCLUDING IRRIGATION, STOCK WATERING, AND TRUCK FARMING.	(SAME AS C)	NOT LIMITING EXCEPT AS IT AFFECTS OTHER WATER QUALITY CRITERIA.	(SAME AS B)	NO IMPOSED VALUES WHICH WOULD INTERFERE WITH THE USE INDICATED.	(NOT APPLICABLE)	NONE IN SUFFICIENT QUANTITIES OR OF THE TYPE TO CAUSE SOIL FLOCKING OR REDUCED YIELD OF CROPS.	(SAME AS C)	LESS THAN THAT QUANTITY DEMONSTRATED TO BE DELETERIOUS TO LIVESTOCK OR PLANTS OR WHICH SUBSEQUENT CONSUMPTION BY HUMANS.	(SAME AS A)	(NOT APPLICABLE)
F. INDUSTRIAL WATER SUPPLY (OTHER THAN FOOD AND DRINK PROCESSING).	(THE REQUIREMENTS OF USE C SHALL BE MET WHEN WORKER CONTACT IS REQUIRED)	(SAME AS B)	(SAME AS B)	FIVE DEGREES	NONE ATTRIBUTABLE TO WASTES WHICH, AFTER MIXING WITH RECEIVING WATERS, WOULD INTERFERE WITH THE USE INDICATED.	(SAME AS B)	NONE ATTRIBUTABLE TO WASTES WHICH, AFTER MIXING WITH RECEIVING WATERS, WOULD INTERFERE WITH THE USE INDICATED.	(SAME AS A)	(NOT APPLICABLE)

gas in a suitable culture medium at 44.5 ± 0.5° C. Inasmuch as organisms from other sources cannot generally produce gas in this manner, this criterion could be used to define the fecal section of the coliform group. The possibility of using the fecal coli index to contamination instead of the total coliform group was considered; however, it was concluded by the Council that this technique is not yet standardized and the use of the total coliform index shall be continued for the present.

Use A. Water supply for drinking purposes suitable for use with simple disinfection.

Natural waters from protected watersheds can be used safely with proper disinfection if special care is taken in the watershed to exclude human sources of bacterial and viral contamination and if the turbidity and organic matter that make disinfection less effective are controlled. Selective alternate diversion facilities, storage reservoirs, and auxiliary sources can be used to control short runoff periods of highly turbid water. It is felt that strict control of human activities in the watershed basin should be mandatory. Waters of this type, uncontaminated by human activity, will normally have an average coliform Most Probable Number (MPN) of less than 50 per 100 milliliters (50/100 ml). Isolated watersheds have been effective in producing a good grade of water where short, flash turbidity peaks are provided for by selective diversion, storage, etc. The significance of coliforms should be correlated with a sanitary survey to determine the origin of the coliform organisms; therefore, the MPN (or equivalent MF counts) shall be most applicable where evidence demonstrates that the coliforms present may be associated with domestic sewage. Samples from isolated watersheds where the stream is slow flowing and wildlife is relatively abundant may have average monthly MPN's above 50 per 100 ml. during the summer warm-water periods. This must be taken into consideration when applying this MPN limit to the Class A use of water.

Class B use. Water supply for drinking purposes suitable for use with complete water treatment.

Although coliform bacteria are admittedly imperfect indicators of bacteriological safety, fecal streptococci, fecal coli, and other indicators have not yet been developed to the point where they are reliable. Because of this, the MPN of 2000/100 ml. which has been in use since 1956 concerning this class of water will be continued for the present. This limit, however, is considered to be the upper limit for waters to be used safely as a source of domestic water supply with ordinary treatment. Waters ordinarily exceeding this limit should not be used unless a better source is not reasonably available.

Class C use. Bathing, swimming and recreation.

Coliform criteria for this use has been a controversial issue for many years simply because there is a lack of sound epidemiological data upon which to base conclusions. For this reason, the U.S. Public Health Service has not seen fit to recommend or establish standards

for bathing water quality. Despite this limitation, many state and local agencies have promulgated bathing water criteria. Most officials accept the viewpoint that while the bacterial quality of water for bathing need not be as high as that for drinking, the water should be reasonably free of bacteria of sewage origin.

A review of state and local standards show that coliform concentrations for acceptable bathing areas range up to 3,000/100 ml. One of the best epidemiological studies was conducted by the Committee on Bathing Beach Contamination of England on more than 40 beaches subject to contamination with sewage. The median coliform counts varied from 40 to 25,000/100 ml. The general conclusions of the Committee based on this five-year study were that bathing in sewage polluted water carries only a negligible risk to health and, where the risk is present, it is probably associated with chance contact with intact sewage aggregrates containing infected fecal material. Unless the water is so foul as to render the bathing beach aesthetically revolting, it would seem that public health requirements are reasonably well met by preventing the pollution of waters with intact fecal matter. The most widely utilized criterion in the United States is patterned after the Ohio River Sanitation Commission's objective that the arithmetical mean coliform density should not exceed 1,000/100 ml. and that this concentration should not be exceeded in more than 20 percent of the samples in any one month. These standards have evidently been established arbitrarily on the basis of aesthetic consideration and compliance ability. None are founded on sound epidemiological evidence that infections have resulted due to bathing in contaminated water.

Class D_1 and D_2. Growth and propagation of fish.

Class E. Agricultural water supply.

Class F. Industrial Water Supply.

The listed values for these water uses is most definitely a public health inovation for the protection of humans rather than lesser animals. Here is an area where an experienced worker should know that an MPN finding of 1,000 to 2,000/100 ml. will very often signify that other water quality characteristics and uses may be suffering from inadequately treated sewage.

Dissolved Oxygen

Most pollution control authorities have historically listed a minimum allowable dissolved oxygen (DO) concentration for the various water uses, in particular, fisheries use. This minimum has been, for the most part, predicated on the survivability of fish and not upon the optimum conditions necessary to support all life stages of fish. It was the general consensus of the Pacific Northwest Pollution Control Council and the Montana Water Pollution Control Council that dissolved oxygen criteria should be expressed in such a fashion that it related to the physical ability of a body of water to carry dissolved oxygen rather than in a minimum necessary to support aquatic life.

Class A Use. Although the dissolved oxygen criteria are based mainly upon the fisheries use of water, dissolved oxygen is a valuable indicator of overall water quality for a surface water supply. Good quality surface waters should remain very close to saturation with oxygen.

Class B Use. Departures from 100 percent saturation are a measure of oxygen-consuming impurities or of oxygen-producing biological activity. Abnormally low DO indicates the presence of excessive quantities of wastes having a high biochemical or chemical oxygen demand. Supersaturation with oxygen is an indication of excessive algal activity and nutrient enrichment. DO levels outside the range of 75 to 100 percent of saturation denote poor water quality which may require extraordinary treatment to produce a safe, high-quality, finished water.

Class C Use. At DO values below 60 percent saturation, ecological changes occur which tend toward slime and other aquatic plant growths which render the area less suitable for water contact purposes.

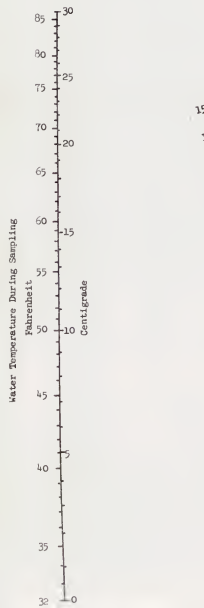
Classes D_1 and D_2 Uses. The study of dissolved oxygen has probably excited the imagination and ambition of water pollution control workers more than any other water quality characteristic. Saturation, or absence of oxygen in water, seems to make little sense, unless related to aquatic life and all research evidence supports having oxygen saturation as an optimum for aquatic life. Human developments tend to make saturation impractical, perhaps impossible, in many instances. Dissolved oxygen needs, particularly in the mountainous areas of Montana, must be geared to salmonoid (trout, whitefish, grayling, salmon) fishes which are the "prima donnas" of both physiological intolerance and economic importance. Since salmonoid fish require a naturally high dissolved oxygen content at all times, there can hardly be a valid argument presented in opposition to setting an absolute low of 75 percent saturation. It must be remembered that any surface waters in this area which are allowed to degenerate to 75 percent saturation in dissolved oxygen will likewise not measure up to the quality demands of most of the other recognized beneficial uses. A genuine need for very nearly 100 percent saturation of dissolved oxygen in spawning, hatching and early rearing stages of salmonoid fishes has been demonstrated conclusively beyond question, both under laboratory and field conditions. For this reason, the limit for dissolved oxygen depletion has been recommended at five percent of the naturally present saturation for those waters supporting resident trout populations. For non-salmonoid waters, waters which are already depressed by wastes, such as agricultural return waters, some of which cannot be feasibly corrected at the present, the recommended minimum is 85 percent saturation during the spawning and rearing stages of non-salmonoid fish.

In order to convert dissolved oxygen values (in parts per million) to percent saturation, a nomograph is presented (Figure 1).

Hydrogen ion concentration (pH)

Classes A and B uses. In general, a good drinking water has a pH between 6.5 and 8.5. Low pH is normally associated with the presence of carbon dioxide, mineral and organic acids and salts of strong acids and weak bases and can result from the presence of acid-reacting

Figure 1. Nomogram for converting dissolved oxygen concentrations (in parts per million = ppm) to the percentage of saturation of dissolved oxygen at various water temperatures and barometric pressures during sampling.



Altitude (ft) and barometric pressure (in. Hg)

Dissolved Oxygen Concentration (ppm)	Sea level 29.92"	2000' 27.32"	3000' 26.81"	4000' 25.34"	5000' 24.99"	6000' 23.98"	7000' 23.09"
14.5	13.5	13.0	12.5	12.0	11.6	11.2	
14.0	13.0	12.6	12.0	11.6	11.2	10.8	
13.5	12.6	12.2	11.6	11.2	10.8	10.4	
13.0	12.1	11.7	11.2	10.8	10.4	10.0	
12.5	11.6	11.2	10.8	10.4	10.0	9.6	
12.0	11.2	10.8	10.3	10.0	9.6	9.2	
11.5	10.7	10.4	9.9	9.5	9.2	8.9	
11.0	10.2	9.9	9.5	9.1	8.8	8.5	
10.5	9.8	9.4	9.0	8.7	8.4	8.1	
10.0	9.3	9.0	8.6	8.3	8.0	7.7	
9.5	8.8	8.6	8.2	7.9	7.6	7.3	
9.0	8.4	8.1	7.7	7.5	7.2	6.9	
8.5	7.9	7.6	7.3	7.1	6.8	6.5	
8.0	7.4	7.2	6.9	6.6	6.4	6.2	
7.5	7.0	6.8	6.4	6.2	6.0	5.8	
7.0	6.5	6.3	6.0	5.8	5.6	5.4	
6.5	6.0	5.8	5.6	5.4	5.2	5.0	
6.0	5.6	5.4	5.2	5.0	4.8	4.6	
5.5	5.1	5.0	4.7	4.6	4.4	4.2	

To use the nomogrr to obtain the percentage of saturation of dissolved oxygen (DO) from a specific concentration (in ppm) at a given altitude (or barometric pressure) and water temperature, locate the actual concentration of DO at the altitude or pressure sampled, move left to the concentration at sea level and place straight edge on this value. Then place the other end of the straight edge on the sampling temperature and read the "Percent Saturation" scale. This is the percentage saturation of DO, corrected for altitude or barometric pressure at the ambient water temperature during sampling.

EXAMPLE:

Given: DO concentration = 8.6 ppm

Water temperature during sampling = 50° F (10° C)

Altitude at sampling point = 4000 ft. or barometric pressure during sampling = 25.84 inches of Hg

To find the percent saturation of DO under these conditions, find 8.6 under 4000 ft.; move left to the DO concentration scale at sea level (10.0 ppm); place straight edge at this point and align straight edge with 50° F on the temperature scale.

Result: About 88 percent

industrial wastes, swamp waters or dissolution of naturally occurring, acid-forming mineral salts. Low pH waters are generally corrosive to metals, are often highly colored and difficult to coagulate.

High pH is normally associated with the presence of bicarbonate and carbonate ions and sometimes with hydroxide, borate, silicate and phosphate ions. High pH values can result in alkaline reacting industrial wastes, intense algal activities and dissolution of naturally-occurring, alkaline salts. High pH waters are generally hard, deposit-forming, and corrosive to some metals.

The 1956 criteria stated a maximum permissible range, but no provisions were made for natural pH's outside this range. The proposed criteria are an attempt to control the variation within a specific range as well as the variations outside that range. Also, it is most desirable that a naturally alkaline water remain alkaline since the aquatic life, endemic to such waters, may not survive a change from an alkaline to an acid environment whereas the opposite can be tolerated by even the most sensitive sport fish and associated aquatic life.

Turbidity

Classes A and B. Turbidity is an indication of suspended matter measured by its interference with the passage of light. It is not a direct equivalent of the amount of suspended matter, since the interference is a function of the size and number of suspended particles. Turbidity of water is due to the suspension in it of clay, silt, finely divided organic matter, microscopic organisms and similar substances.

Excessive turbidities indicate degradation of a stream by natural or artificial causes. Large quantities of turbidity-causing materials impose heavy loadings on treatment facilities and if they are soluble, can impart dissolved impurities to the water with resultant deterioration of quality. High turbidity, especially when a result of finely divided inorganic matter, may retard the growth of aquatic flora (plankton and algae) and may absorb organic and radioactive materials.

Turbidity during normal runoff may be less than 5 Jackson Candle units (JCU). During short periods of highly turbid natural runoff, selective and alternate diversion or use of auxiliary water sources should be employed to keep the water clear in order that it can be effectively disinfected when it is used as a Class A water supply.

Class C. Waters with turbidities exceeding 10 JCU are not suitable for water contact uses for three reasons:

1. The waters are aesthetically not acceptable.
2. There is danger from unseen submerged material.
3. It is not safe for swimming, since the swimmers cannot see the bottom or side configuration.

Classes D_1 and D_2. The limits for turbidity here are predicated primarily on the basis of inorganic particulate matter. It has been amply demonstrated that acute damage to adult fish by very high turbidities is minimal and reparable provided that the period of exposure

is not prolonged not withstanding adverse side effects such as interference with light penetration or modification of the temperature regime of the water body. The most critical period in the life history of fish as it concerns turbidity is during the incubation of eggs in the redds. Further, nature of the turbidity is important, since plankton blooms have not been incriminated while inorganic particulate matter is damaging. Turbidity cannot be related directly to siltation, since siltation characteristics are a function of velocity, gradient, and bottom type.

Classes E and F. Unless caused by suspended soil particles, turbidity limits would not necessarily apply. The closing of the pore space in the soil; however, results in reducing infiltration rates and less efficiency of irrigation application. Deposition in headgates, canals, and laterals causes excessive maintenance costs. There is no concentration which would prohibit its use, but a reasonable concentration up to 200 JCU may be a desirable goal unless from natural causes. Concerning the industrial use of water, abrasion would be the most objectionable property of materials causing turbidity. Such waters may have to be treated. For the most part, turbid waters which may have an adverse affect upon the agricultural and industrial use of water are treated under "Sediment or Settleable Solids."

Temperature

The proposed temperature criteria are based primarily on the fishery use of water.

Class A. In general, for drinking purposes, waters with a temperature of 65° F. are reported to cause complaints from most consumers. Increased temperature may stimulate organic growth and intensify taste and odor problems. If natural temperatures of water used for Class A supplies are in excess of 67° F., no wastes of higher temperatures should be discharged to the waterway; however, the limit has been set at 1/2° F. It has been pointed out that 1/2° may or may not be a practical limit after water temperatures have exceeded 67° F.; however, this is meant to permit the discharge of treated waste, such as that from a gravel washer, and would probably be applied only on a computed basis.

Class B. Not only is temperature important in its own right as a quality characteristic, but it influences the saturation values of solids and gases that the water can absorb and the rates of chemical, bio-chemical and biological activities, such as corrosion, BOD and the growth and death of micro-organisms.

Waters with temperatures greater than 67° are likely to support excessive biological and bacterial growths, have a flat, unpleasant taste, and be generally unappealing as a source of domestic water supply.

Class C. This appears to be a personal factor. No normal range appears to be practical for everybody. Some thought was given to consideration of cold water discharged from huge storage reservoirs during periods of temperature stratification; however, it is not anticipated that problems will develop concerning this use.

Classes D_1 and D_2. The temperature criteria proposed for salmonoid and non-salmonoid waters are meant to apply mostly during the hot weather months. They are based on the upper tolerance limits for salmonoids which may vary among this group of fishes in their tolerance to high temperatures. For this reason, and since cooling of waters by discharges from the hypolimnion of large, thermally stratified, reservoirs can be advantageous at times, an exception to the general criterion has been provided. In such cases, the governing entity would be "where damage to designated water use cannot be predicted or demonstrated, a greater range of induced change will be allowed." It is felt that with this clause, the temperature criteria proposed to sustain an optimum fishery (particularly in D_1 waters) will not restrict the use of waters as disposal for heated effluents where damage to a fishery cannot be predicted or demonstrated.

Classes E and F. Consideration was given to the effect of water temperatures upon the agricultural and industrial water supply uses and although cold waters may have a physiological shock on plants and absorb thermal energy when the air and ground temperatures are greater than the applied water temperature, it is not felt that this would be a factor in Montana.

Concerning industrial use, the limit of five degrees above existing water temperatures is proposed as a protection for a downstream industrial use which may be affected by another use immediately upstream.

Residues Including Oil, Floating Solids and Sludge Deposits

Class A. Waters for this use are objectionable if any oils, floating solids, settleable solids, or sludge deposits are in evidence. Even small amounts of these residues may react unfavorably with chlorine to cause objectionable tastes and odors.

Class B. Oil, floating solids, suspended solids, sludge and sediment are objectionable because they complicate and increase cost of treatment and in some cases cannot be satisfactorily removed.

Class C. One of the most disheartening sights in recreational areas is floating debris, grease, scum or sludge. This is expecially true when a swimmer dives to the bottom and kicks loose a raft of foul-smelling sludge that has accumulated there. Gravel operations, which discharge silt and muddy waters, also degrade water quality for contact sports. Grease, scum and foam often accumulate on log rafts or floating piers and become occasional hazards to the workers.

Classes D_1 and D_2. Numerous residues known to accumulate from wastes would make a lengthy list, but attention is directed further to harmful residues resulting from the nutrient stimulation of secondary growths. Bacterial slime, Sphaerotilus, is a classical example of secondary growth residue resulting from wood sugars in industrial wastes and some sugars in sewage. Nuisance algal and water weed growths may likewise become objectionable secondary residues. Floating residue, such as oil, may have little effect

on water quality, but are definitely deleterious to water fowl even in small quantities.

Class E - Agricultural Water Supply. Reduced yields of crops have been experienced when irrigation water is contaminated by petroleum products and infiltration reduced. Slimes and aquatic growths increase maintenance costs and create operational problems.

Class F. Residue should be treated before discharge since industry may consider this a limiting factor when expanding facilities or establishing in new areas.

Sediment or Settleable Solids

Class A. Sediment, in measurable amounts, settles in reservoirs, in pipelines or at points of use of water; therefore, it should be excluded where there are no treatment facilities, other than simple disinfection. Again, use of alternate sources, storage and settling basins should be considered during periods of high water runoff.

Class B. Sediment in general can be removed in water treatment procedures, but the removal is costly; therefore, sediment should be limited to those values which will not interfere with the level of treatment in use. Concerning this particular use, it has been demonstrated that a small amount of sediment is desirable since it does form a coagulant media facilitating the removal of suspended material.

Class C. This has been mentioned under "Turbidity," but it should be repeated that the quantity of sediment should not exceed that amount that makes it impossible to see into the water. There should be no interference with the normal ecology of the hydrosphere.

Classes D_1 and D_2. Sediment which fills the interstices of the stream bottom materials adversely affects the fisheries use of water and it should be excluded. Such sediment acts to suffocate fish eggs in redds and renders the stream bottom so "tight" that emerging fry cannot escape into the water above.

Class E. The impact of sediment on irrigation water use depends on the size and concentration of particles and the method of application and use of the water. Excessive wear of sprinkler nozzle heads occurs when sediment larger than about 0.074 millimeters in size is present in the distribution system. Settling ponds and filters may be required to precondition water for sprinkler use.

Extended application of irrigation water at a solids load concentration higher than 200 mg/l tends to close pore spaces in the soil thereby reducing infiltration rates and lowering the efficiency of application. Recharge of underground basins by prolonged spreading of water that contains sediment load concentrations higher than 200 mg/l tends to clog the pores and reduce the intake rate. Acceptable concentrations above minimal levels depends on the duration of use and characteristics of the soil or soil material on which the water is being applied or spread.

Water containing sediment has not been found to be injurious to livestock; however, given a choice between clear and silty water, stock consume more clear water, thereby resulting in greater gains in weight.

The effect of sediment on agricultural water facilities includes deposition in headgates, canals, and laterals, irrigation reservoirs and stock ponds. The result can be higher maintenance costs and loss of needed water storage capacity.

Class F. Sediment is difficult and expensive to remove and should be excluded at the source whenever possible.

Toxic or Other Deleterious Substances

Classes A and B. The U. S. Public Health Service Drinking Water Standards of 1962 list chemical substances that should not be exceeded where more suitable alternate supplies can be made available as follows:

Substance	Concentration in mg/l
Alkyl Benzene Sulfonate (ABS)	0.5
Arsenic (As)	0.01
Chloride (Cl)	250.
Copper (Cu)	1.
Carbon Chloroform Extract (CCE)	0.2
Cyanide (CN)	0.01
Iron (Fe)	0.3
Manganese (Mn)	0.05
Nitrate[1] (NO_3)	45.
Phenols	0.001
Sulfate (SO_4)	250.
Total Dissolved Solids	500.
Zinc (Zn)	5.

[1] In areas in which the nitrate content of water is known to be in excess of the listed concentration, the public should be warned of the potential dangers of using the water for infant feeding.

Any concentrations of substances in excess of the following listing are cause for rejection of the supply.

Substance	Concentration in mg/l
Arsenic (As)	0.05
Barium (Ba)	1.0
Cadmium (Cd)	0.01
Chromium (Hexavalent) (Cr^{+6})	0.05
Cyanide (CN)	0.2
Lead (Pb)	0.05
Selenium (Se)	0.01
Silver (Ag)	0.05

Class C. These materials have not been shown to have much public health significance in water contact sports, however, some provision should be made to limit them, since they are potentially hazardous.

Classes D_1 and D_2. Toxic or other deleterious substances are included in a grouping of materials causing many of the more subtle environmental changes. The affects of these are usually most accurately evaluated through bioassays. Pesticides and related compounds have been studies extensively for their effects on aquatic life; however, there is still much unknown about their total effect upon an aquatic ecosystem. The Council's recommendations for limits concerning these materials are the arbitrary reduction factors of 1/10 and 1/100 as applied to the median tolerance limit arrived at during a four-day period (TL_m^{96}). These arbitrary factors may be too high in some cases and too low in others and only experience will dictate accuracy here. For that reason, these proposed limits are considered subject to change periodically as more information is gathered concerning toxic and other deleterious substances.

The exception providing for authorization of the use of pesticides by the Council for beneficial purposes is intended to apply to the rehabilitation of streams by use of piscicides. Quite obviously, the elimination of trash fish would require a toxic dose far in excess of one tenth of the four-day, median tolerance limit. However, it is not intended to prohibit the beneficial use of insecticides and herbicides when applied in an approved manner.

Classes E and F. No particular cataloging of the toxicity of substances to livestock, such as the U. S. Public Health Service Drinking Water Standards for humans, is readily available. The toxicology of materials concerning plants and animals is widely scattered in reference materials and no specific limits can be proposed.

Radioactivity

Montana has not yet had a major problem with artificially-formed radioactive materials; however, since some of the streams are naturally quite high in concentration of these materials, it was thought best to establish some sort of limit at this time.

It is felt that the Drinking Water Standards of 1962 will suffice to protect the waters of the state from excess fission products, except where concentration by aquatic plants and animals becomes a factor. In those cases, an exception has been made to the 1962 Drinking Water Standards allowing for source control when the aquatic flora and fauna concentrate radioactive materials beyond safe limits.

Aesthetic Consideration -- wastes offensive to the senses of sight, touch, smell or taste.

Consideration was given to designating "Aesthetics" as another beneficial water use. However, Montana law does not recognize this as a legal use of water. It was felt, however, that the lack of some regulation of wastes offensive to the senses has been a weak point in

water pollution control programs historically and that there was a definite need for some control of these wastes.

Class A. Wherever simple disinfection is the only treatment, the senses of sight, smell, taste and touch are good indicators. Anything that is offensive to these senses is not acceptable in the water supply.

Class B. To be acceptable, the raw water should contain no wastes which are offensive to the senses. Treatment costs for the removal of these materials are high when compared with conventional costs.

Class C. It has been noted throughout the revision of these standards that many restrictions are a result of aesthetic considerations. People will avoid areas degraded by floating solids, scum, excess aquatic growths or other evidences of pollution. To approve water contact use, it is necessary to exclude these unsightly and potentially harmful materials.

Classes D_1 and D_2. Aesthetic considerations are mostly for humans who may be seeking recreational enjoyment through fishing or other water sports.

Classes E and F. For the most part, those wastes offensive to the senses do not particularly damage the use of water by agriculture and industry; however, irrigation water should not contain any floating, suspended or dissolved solids from domestic or industrial wastes and the treatment of water for industrial uses may be considerably complicated by the presence of suspended, floating or dissolved matter, scums, oils or other objectionable matter in water supplies.

WATER USE CLASSIFICATIONS

The 1956 criteria recognized five water uses, one of which (water supply) was divided into two different uses on the basis of natural water quality, and another which was combined (agricultural and industrial water supply). The proposed criteria recommends that seven uses be recognized. The same treatment is proposed for water supply; namely, Class A and Class B with the former being a water supply suitable for use with no treatment other than simple disinfection and the removal of naturally present impurities. It is further recommended that agricultural and industrial water supply be divided into two classes; namely, E and F, respectively.

The other major change involves a division of the fisheries use into D_1 and D_2 classes with D_1 use being a high quality salmonoid (trout, whitefish, grayling and salmon) sport fishery and D_2 being primarily non-salmonoid fisheries. The latter is further predicated on the basis of salmonoid water already depressed by wastes which cannot be feasibly corrected at the present or waters on which degradation (either natural or uncontrollable) will be least

damaging to the Montana fishery as a whole. This division is necessary since it is quite obvious that the same water quality criteria cannot apply equally throughout the entire state. Water use characteristics necessary for the maintenance of a resident salmonoid fishery are entirely too stringent for the lower sections of the larger rivers which historically have not supported salmonoid fish.

Some waters used by municipalities have been classed as "A use only" by the Montana Water Pollution Council. This does not appear to comply with the intent of the 1955 Water Pollution Act, which is predicated on the basis of multiple use:

> "It is the public policy of this state to: (a) conserve water by protecting, maintaining and improving the quality and potability of water for public water supplies, wildlife, fish and aquatic life, agriculture, industry, recreation and other beneficial uses; . . ."

It is the purpose of the Council to determine these uses; however, it does not have the authority to restrict water use. An "A only" designation is a restrictive water use. Since the actual intent of water use classification is to maintain water quality at the level where none of the proposed water uses are damaged, the proposed water quality criteria will show Class A waters as being suitable for Classes A and lower uses. This, on the other hand, suggests that such water should be open to other uses, such as fishing. In those cases where it is undesirable or unsafe to allow other uses, it is felt that health authorities, in cooperation with the utility owner (generally the city) and representatives of watershed management, such as the Forest Service, cooperate to restrict other uses. Such restrictions must be enforced locally, however, and generally by the utility owner.

APPLICATION OF WATER QUALITY CRITERIA AND WATER USE CLASSIFICATIONS

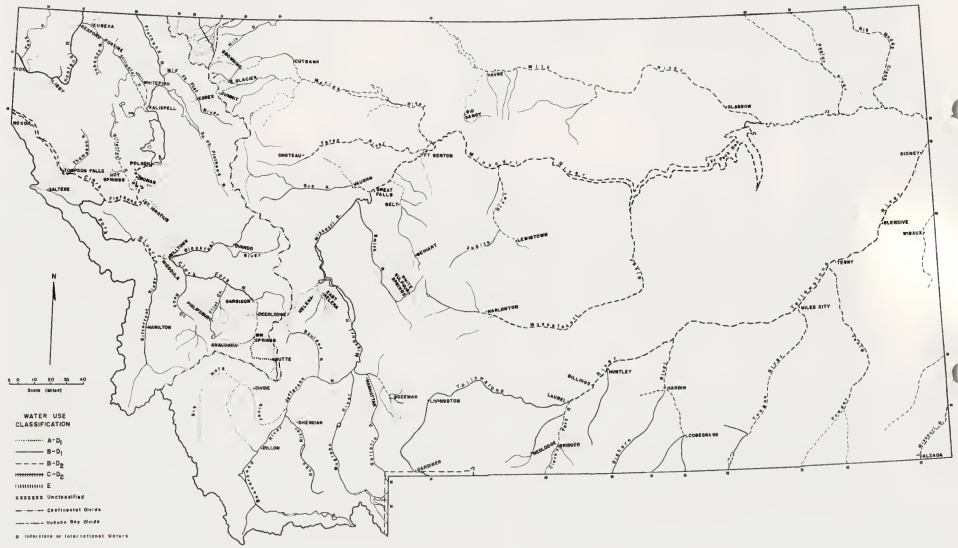
Although an attempt is being made to apply numerical parameters to water quality descriptions in as many cases as possible, it is recognized that many of these limits are arbitrary. The best information available has been used as a basis; however, some criteria may be too lenient and others too stringent. As has been mentioned before concerning toxic materials, all of these water quality criteria are considered subject to change as technological advances are made and better descriptions of the various characteristics develop. Just as much of the 1956 criteria has become antiquated, these standards will be in need of modernization as time passes. As the need for updating becomes apparent, the process leading to public hearings will again be employed.

It will be noted that concerning water characteristics a "lower class" use may have a more demanding criterion than a "higher class" water. For example, concerning dissolved oxygen, a Class A water calls for greater than 75 percent of saturation while a Class D_1 water requires that the oxygen be maintained within five percent of naturally occurring conditions. With the latter criterion being the most demanding, the Class D_1 requirement governs all other uses above

and below it. In reviewing the proposed water use classifications, it was readily apparent that using the multiple use concept, we are dealing with primarily two or three water use classifications, namely, Classes $A\text{-}D_1$, $B\text{-}D_1$ and $B\text{-}D_2$. (There are no $A\text{-}D_2$ waters). For the purposes of this presentation, this type of use classification will be presented (Table 3).

A few general statements can be made concerning the following proposed use classifications. With a few exceptions, all waters west of the Continental Divide are Class $B\text{-}D_1$ (Figure 2). Further, and very roughly, a line running from Laurel to Lewistown to Great Falls, thence, to Cut Bank, could be used to separate Class $B\text{-}D_1$ from Class $B\text{-}D_2$ waters with the latter being east of this line. A major exception to this is the headwaters of the Big Horn , which are Class $B\text{-}D_1$ (Figure 2).

FIGURE 2 PROPOSED WATER USE CLASSIFICATION AND INTERSTATE & INTERNATIONAL WATERS OF MONTANA



A PROPOSED RE-CLASSIFICATION OF
PRESENT AND FUTURE MOST BENEFICIAL WATER USES BY THE
MONTANA WATER POLLUTION CONTROL COUNCIL

Columbia Basin - Clark Fork Drainage - Clark Fork River

BODY OF WATER	LOCATION	PRESENT USE[1]	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED[2]
Yankee Doodle Cr. & tributaries	From source to the Butte water supply reservoir	WSp (Butte)		A	A-D_1
Blacktail Deer Creek & tributaries except Basin Creek	From source to its confluence with Silver Bow Creek	Ag, F & R, WSi	Lower section will be intermittent after industrial water supply intake is installed	C,D,E	C-D_2
Basin Creek and tributaries	From source to Butte water supply reservoir	WSp (Butte)		A	A-D_1
Silver Bow Cr. (mainstem)	From its source at the confluence of Yankee Doodle & Blacktail Deer Creeks to its confluence with Warm Springs Creek	PS, IW	Presently exempt from classification by Montana law. In absence of waste flows, this stream would be intermittent	-	-
All tributaries to Silver Bow Creek	Joining Silver Bow Creek between its source and Warm Springs Creek	Ag, F & R	Most are intermittent in lower sections	B,C,D,E,	B-D_1

Note: Common sense dictates that the Class C designation will not apply within a reasonable distance downstream from sewage treatment plant outfalls.

[1] WS - water supply (p - public; i - industrial; o - private or resort); WP - water power; PS - treated public sewage disposal; IW - treated industrial waste disposal; F & R - Fish & Recreation; Ag-Agriculture

[2] A-D_1 - A,C,D_1, E & F uses; B-D_1 - B,C,D_1, E & F; B-D_2 - B,C,D_2, E & F; C-D_2 - C, D_2, E & F; E - E & F uses

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
Warm Springs Creek and tributaries	From source to Myers Dam	WSp(Anaconda) WSi, Ag, F & R		A,C,D,E	A-D_1
Warm Springs Creek and Tributaries	From Myers Dam to its confluence with Silver Bow Creek to form the Clark Fork River	Ag, F & R		C,D,E,	C-D_2
Clark Fork River	From its source to its confluence with Little Blackfoot River near Garrison	Ag, F & R		E	C-D_2
All tributaries to the Clark Fork River except the portion of Tin Cup Joe Creek listed below	Joining the Clark Fork River between Warm Springs Creek and the Little Blackfoot River	Ag, F & R		B,C,D,E	B-D_1
Tin Cup Joe Creek and tributaries	From source to the Deer Lodge water supply intake	WSp (Deer Lodge), Ag, F & R	Water supply intake has been (or will be) moved upstream	A,C,D,E	A-D_1
Clark Fork River (mainstem)	From the Little Blackfoot River to its confluence with Rattlesnake Creek in Missoula	Ag, F & R, PS, IW, WP		E & D,E	B-D_1

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION PRESENT	CLASSIFICATION PROPOSED
All tributaries to the Clark Fork River except those listed below	Joining the Clark Fork River between the Little Blackfoot River and Rattlesnake Creek	Ag, F & R, PS, IW		B,C,D,E	B-D_1
Georgetown Lake and headwaters	From source to Georgetown Dam	WSp, WSi, WSo, Ag, F & R	Water supply for city of Anaconda and the Anaconda Company	A,C,D,E	B-D_1
Flint Creek and tributaries except those listed below	From Georgetown Dam to its confluence with the Clark Fork River	Ag, F & R, PS, IW	Need better control of storm sewage and industrial wastes from the Philipsburg area	C,D,E	B-D_1
Fred Burr Lake and headwaters	From source to outlet of Fred Burr Lake	WSp (Philipsburg)		A	A-D_1
Boulder and South Boulder Creeks	From source to Philipsburg's water supply intake	WSp (Philipsburg) Ag, F & R		A	A-D_1
Clark Fork River (mainstem)	From its confluence with Rattlesnake Creek to its confluence with Nine Mile Creek	Ag, F & R, IW, PS		B,C,D,E	B-D_2
All tributaries to the Clark Fork River except those listed below	Joining the Clark Fork between Rattlesnake Creek and the Idaho line	Ag, F & R, IW, PS		B,C,D,E	B-D_1

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
Rattlesnake Creek and tributaries	From source to the Montana Power Company water supply intake	WSp (Missoula)		A	$A\text{-}D_1$
Clark Fork River (mainstem)	From Nine Mile Creek to its confluence with the Flathead River near Paradise	Ag, F & R, PS	Alberton & Superior planning for sewerage systems	B,C,D,E	$B\text{-}D_1$
Packer and Silver Creeks (tributary to the St. Regis River)	From source to the Saltese water supply intake	Wsp (Saltese)		A	$A\text{-}D_1$
Clark Fork River (mainstem)	From its confluence with the Flathead River to the Idaho line	Ag, F & R, PS	Thompson Falls planning for a sewerage system	B,C,D,E	$B\text{-}D_2$
Ashley Creek and tributaries	From its source to the Thompson Falls water supply intake	WSp (Thompson Falls)		A	$A\text{-}D_1$
Pilgrim Creek and tributaries	From its source to the Noxon water supply intake	WSp (Noxon)		A	$A\text{-}D_1$

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
Flathead River and tributaries except those listed below	From source to Kerr Dam including Flathead Lake	Ag, F & R, WSo, WSp (Great Northern Railroad at Whitefish) PS, IW		B,C,D,E to Flatheat L.; A,C,D,E Flathead L. & tributaries	B-D_1
Essex Creek (may be Marian Creek, tributary to Essex Creek)	From source to Essex water supply intake	WSp (Essex) Ag, F & R		A,C,D,E	A-D_1
Stillwater River (mainstem)	From its confluence with Logan Creek to its confluence with the Flathead River	Ag, F & R	Dewatered & degraded by irrigation	B,C,D,E	B-D_2
Whitefish River (mainstem)	From the outlet of Whitefish Lake to its confluence with the Stillwater River	Ag, F & R, IW, PS	Dewatered and degraded by irrigation	B,C,D,E	B-D_2
Ashley Creek (mainstem)	From the outlet of Kila Lake (Smith Lake) to the Kalispell sewage treatment plant outfall	Ag, F & R	Severely dewatered	B,C,D,E	B-D_2
Ashley Creek	From the Kalispell sewage treatment plant outfall to its confluence with the Flathead River	Ag, PS	Severely dewatered and intermittent in sections	D,E	E
Haskill Creek and tributaries	From its source to the Whitefish water supply intake	WSp (Whitefish)		A	A-D_1

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
Flathead River (mainstem)	From Kerr Dam to its confluence with the Clark Fork River	Ag, F & R		B,C,D,E	$B\text{-}D_2$
All tributaries to Flathead River except those listed below	Joining Flathead River between Kerr Dam and its confluence with the Clark Fork River	Ag, F & R		B,C,D,E	$B\text{-}D_1$
Hellroaring Creek and tributaries	From source to the Polson water supply intake	WSp, WP, Ag		A	$A\text{-}D_1$
Little Bitterroot River	From Hubbart Reservoir dam to its confluence with the Flathead River	Ag, F & R		B,C,D,E	$B\text{-}D_2$
Hot (Warm) Springs Creek	From its source to the Hot Springs water supply intake	WSp (Hot Springs)		A	$A\text{-}D_1$
Hot (Warm) Springs Creek	From the Hot Springs water supply intake to its confluence with the Little Bitterroot River	Ag, PS	Severely dewatered and intermittent	B,C,D,E	E
Crow Creek	From Crow Creek Reservoir dam to its confluence with the Flathead River	Ag, F & R		B,C,D,E	$B\text{-}D_2$
Middle Fork Crow Creek and tributaries	From its source to the Ronan Water supply intake	WSp (Ronan)		A	$A\text{-}D_1$

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
Spring Creek	From the Ronan sewage lagoon outfall to its confluence with Crow Creek	Ag, F & R, PS		B,C,D,E	B-D_2
Mission Creek	From Mission Lake to the St. Ignatius water supply intake and including Mission Lake	WSp (St. Ignatius)		A	A-D_1
Mission Creek	From St. Ignatius sewage lagoon outfall (s) to its confluence with the Flathead River	Ag, F & R, PS		B,C,D,E	B-D_2

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
Kootenai River and tributaries except those listed below	From British Columbia, Canada - Montana International Boundary to the Montana - Idaho line	Ag, F & R, IW, PS (WP after Libby Dam)		B,C,D,E	$B\text{-}D_1$
Deep Creek tributary to the Tobacco River	From source to the Fortine water supply intake	WSp, Ag, F & R		A,C,D,E	$A\text{-}D_1$
Sinclair Creek	From source to Eureka water supply intake	WSp, Ag, F & R	Supply is located such that further water treatment is needed by Eureka	B,C,D,E	$B\text{-}D_1$
Sullivan Creek and tributaries	From source to Rexford water supply intake	WSp, Ag, F & R		A,C,D,E	$A\text{-}D_1$
Rainy Creek	From Zonolite mill waste outfall to its confluence with the Kootenai River	IW, Ag, F & R	Waste from Zonolite mill - will be treated after July 1, 1968	B,C,D,E	$C\text{-}D_2$
Flower Creek and tributaries including lakes	From source to Libby water supply intake	WSp, Ag, F & R		A,C,D,E (Creek) A (Lakes)	$A\text{-}D_1$

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
Missouri River and tributaries except those listed below	From source or from the Wyoming - Montana line to its confluence with the Sun River in Great Falls	Ag, F & R, WP, PS, IW, WSo, WSi		B,C,D,E	B-D_1
Big Hole River and tributaries	From its source to its confluence with the Jefferson River near Twin Bridges	Ag, F & R, WSp (Butte)		A,C,D,E	A-D_1
Rattlesnake Creek and tributaries (Tributary to Beaverhead River)	From source to Dillon water supply intake	WSp (Dillon)		A,C,D,E	A-D_1
Indian Creek and tributaries (Tributary to Ruby River)	From source to Sheridan water supply intake	WSp (Sheridan)		A,C,D,E	A-D_1
Lyman and Bozeman (Sourdough) Creeks - (Tributaries to Bridger Creek and the East Gallatin River)	From source to the Bozeman water supply intake	WSp (Bozeman)		A,C,D,E	A-D_1
Hyalite (Middle) Creek	From source to Bozeman water supply intake	WSp, Ag, F & R	Not a restricted use watershed	A,C,D,E	B-D_1

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
East Gallatin River (mainstem)	From Montana Highway #293 crossing about one-half mile north of Bozeman to its confluence with Dry Creek about five miles east of Manhattan	Ag, F & R, PS		B,C,D,E	$B\text{-}D_2$
Basin Creek (Tributary to the Boulder River)	From its source to the Basin water supply intake	WSp (Basin)		A,C,D,E	$A\text{-}D_1$
McClellen, Jackson, and Crystal Creeks	From source to East Helena water supply intake	WSp, Ag, F & R		A,C,D,E	$A\text{-}D_1$
Ten Mile Creek and tributaries	From source to Helena water supply intake	WSp, Ag, F & R		A,C,D,E	$A\text{-}D_1$
Prickley Pear Creek	From Montana Highway #433 crossing about one-mile northwest of East Helena to its mouth	Ag, PS, IW	Intermittent	E	E
Willow Creek (Tributary to the Smith River)	From source to its confluence with the Smith River	WSp (White Sulphur Springs)		A,C,D,E	$A\text{-}D_1$
Missouri River and tributaries except those listed below and the portion of the Missouri River listed below	From its confluence with the Sun River to the Montana-North Dakota Line	Ag, F & R, WSp, WSi, WP, IW, PS		B,C,D,E	$B\text{-}D_2$

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
Sun River and tributaries	From source to its confluence with Muddy Creek	Ag, F & R		B,C,D,E	$B\text{-}D_1$
Muddy Creek	From its source to its confluence with the Sun River near Vaughn	Ag	Except for spring run-off, this stream is entirely irrigation return flows from Greenfield irrigation project	B,C,D,E	E
Belt Creek and tributaries including Little Belt Creek and O'Brien Creek listed below	From source to its confluence with Otter Creek	Ag, F & R, IW		B,C,D,E	$B\text{-}D_1$
O'Brien Creek and tributaries	From its source to Belt Creek	WSp (Neihart)		A,C,D,E	$A\text{-}D_1$
Highwood Creek drainage	From source to the Missouri River	Ag, F & R		B,C,D,E	$B\text{-}D_1$
Shonkin Creek drainage	From its source to its confluence with the Missouri River	Ag, F & R		B,C,D,E	$B\text{-}D_1$
Marias River (mainstem)	From Tiber Dam to its confluence with Pondera Coulee excluding Pondera Coulee	Ag, F & R		B,C,D,E	$B\text{-}D_1$
Cutbank Creek and tributaries except the portion of Willow Creek listed below	From its source to its confluence with Old Maid (Miller) Coulee in Cutbank	Ag, F & R WSp (Cutbank)		B,C,D,E	$B\text{-}D_1$

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
Cutbank Creek	From its confluence with Old Maid (Miller) Coulee to its confluence with the Marias River	Ag, F & R, PS		B,C,D,E	$B\text{-}D_2$
Willow Creek (mainstem)	From Browning sewage lagoon outfall to its confluence with Cutbank Creek	Ag, F & R, PS		B,C,D,E	$B\text{-}D_2$
Two Medicine Creek and tributaries except Midvale and Summit Creeks	From its source to its confluence with Badger Creek and including Badger Creek	Ag, F & R		B,C,D,E	$B\text{-}D_1$
Midvale Creek and tributaries	From its source to Two Medicine Creek	WSp (East Glacier) Ag, F & R		A,C,D,E	$A\text{-}D_1$
Summit Creek	From its source to the Summit water supply intake	WSp, Ag, F & R		B,C,D,E	$A\text{-}D_1$
Teton River and tributaries	From its source to its confluence with Deep Creek near Choteau and including Deep Creek Drainage	Ag, F & R		B,C,D,E	$B\text{-}D_1$
Judith River and tributaries except those listed below	From its source to its confluence with Big Spring Creek	Ag, F & R		B,C,D,E	$B\text{-}D_1$
Big Spring Creek and tributaries	From its source to its confluence with the East Fork of Big Spring Creek including the East Fork	Ag, F & R		B,C,D,E	$B\text{-}D_1$

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
Big Spring Creek (mainstem)	From the East Fork of Big Spring Creek to its confluence with the Judith River	Ag, F & R, PS		B,C,D,E	$B\text{-}D_2$
All other tributaries to the Judith River	Joining the Judith River between its confluence with Big Spring Creek and its confluence with the Missouri River	Ag, F & R		B,C,D,E	$B\text{-}D_1$
Musselshell River and tributaries	From source to its confluence with Hopley Creek near Harlowton	Ag, F & R, PS		B,C,D,E	$B\text{-}D_1$
American Fork Drainage	From its source to its confluence with the Musselshell River	Ag, F & R		B,C,D,E	$B\text{-}D_1$
Milk River and tributaries except those listed below	From source to the Montana - Alberta International Boundary	Ag, F & R, WSp, PS, IW		B,C,D,E	$B\text{-}D_1$
Big Sandy Creek and tributaries	From its source to the community of Big Sandy	Ag, F & R		B,C,D,E	$B\text{-}D_1$
Beaver Creek Drainage	To its confluence with the Milk River near Havre	Ag, F & R		B,C,D,E	$B\text{-}D_1$
Box Elder Creek Drainage	To its confluence with the Milk River	Ag, F & R		B,C,D,E	$B\text{-}D_1$
Clear Creek Drainage	To its confluence with the Milk River	Ag, F & R		B,C,D,E	$B\text{-}D_1$

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
Peoples Creek and the South Fork of Peoples Creek	From source to their confluence	Ag, F & R		B,C,D,E	$B\text{-}D_1$
Missouri River (mainstem)	From Fort Peck dam to its confluence with the Milk River	Ag, F & R		B,C,D,E	$B\text{-}D_1$

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
Yellowstone River and tributaries	From source to Montana - Wyoming line or from Wyoming - Montana line (or from source) to the Laurel water supply intake	Ag, F & R, WSp, WSi, PS, IW		A,C,D,E and B,C,D,E	B-D_1
Yellowstone River and tributaries except those listed below	From Laurel water supply intake to the North Dakota line	Ag, F & R, WSp, WSi, PS, IW		B,C,D,E	B-D_2
Clark's Fork River and tributaries	From source to the Montana - Wyoming line, (or from their source), and from the Wyoming-Montana line to its confluence with Jack Creek near Bridger including Jack Creek	Ag, F & R, PS		B,C,D,E	B-D_1
All tributaries to the Clark's Fork	Joining the Clark's Fork between its confluence with Jack Creek and its confluence with the Yellowstone River	Ag, F & R, WSp, WSi, PS, IW	Access to West Fork Rock Creek and upper Rock Creek not restrictive enough for Class A municipal water supply	A,C,D,E and B,C,D,E	B-D_1
Pryor Creek Drainage	To its confluence with the Yellowstone River	Ag, F & R		B,C,D,E	B-D_1
Big Horn River and tributaries	From source to Montana - Wyoming line or from Montana-Wyoming line (or from their source) to its confluence with Williams Coulee near Hardin and including Williams Coulee	Ag, F & R, WP, PS		B,C,D,E	B-D_1

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
Little Big Horn and tributaries	From Montana - Wyoming line or from source to its confluence with Lodge Grass Creek near Lodge Grass including Lodge Grass Creek	Ag, F & R		B,C,D,E	$B\text{-}D_1$
Tongue River (mainstem)	From Tongue River Reservoir dam to its confluence with Prairie Dog Creek excluding the latter	Ag, F & R		B,C,D,E	$B\text{-}D_1$

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
Little Missouri River drainage in Montana	From Montana - Wyoming line (or from source) to Montana - South Dakota and Montana - North Dakota line	Ag, F & R, PS	Many of the tributaries are intermittent	B,C,D,E	$B-D_2$
Belle Fourche River drainage in Montana (Belle Fourche River is tributary to the Cheyenne River in Wyoming	From source to Wyoming or South Dakota line	Ag, (F & R?)	These tributaries are probably all intermittent and F & R use is questionable	B,C,D,E	$B-D_2$

BODY OF WATER	LOCATION	PRESENT USE	REMARKS	CLASSIFICATION	
				PRESENT	PROPOSED
Waterton River Drainage	From source to Montana - Alberta International Boundary	F & R		A	$A\text{-}D_1$
Belly River Drainage	From source to Montana - Alberta International Boundary	F & R		A	$A\text{-}D_1$
St. Mary River and tributaries except for those listed below	Within Glacier National Park	F & R		A	$A\text{-}D_1$
Divide Creek (mainstem)	That portion forming Glacier Park Boundary to its confluence with the St. Mary River near St. Mary	F & R		B	$B\text{-}D_1$
Swiftcurrent Creek and tributaries	From source to the Many Glacier Chalet sewage treatment plant outfall	F & R		A	$A\text{-}D_1$
Swiftcurrent Creek (mainstem)	From Many Glacier Chalet sewage treatment plant outfall to its confluence with Lower St. Mary Lake	F & R, PS		B	$B\text{-}D_1$
All other tributaries to Swiftcurrent Creek	Within Glacier Park boundary	F & R		A	$A\text{-}D_1$
St. Mary River and tributaries	From Glacier Park boundary to Montana - Alberta International boundary	F & R, Ag		B	$B\text{-}D_1$

IMPLEMENTATION AND ENFORCEMENT

The 1955 Montana Water Pollution Law contained a section on permits which was unworkable because of its wording. This was changed by the 1967 Legislature to provide an effective permit system (See Appendix). The revised section requires a waste discharger to have a current permit from the State Board of Health and allows the Department of Health to revoke the permit without a hearing if violation of the permit causes damage to the water use. It is planned to first establish a permit system for any new waste sources and then, as time allows, to include existing wastes under the permit system.

In the "Stream Criteria" adopted by the Montana Water Pollution Council in 1956 (which became effective as water use classifications were adopted), minimum treatment requirements for domestic sewage were listed as "primary treatment and effective disinfection or sewage lagoon treatment except in special cases as determined by the Montana State Board of Health." It is proposed additionally to have a minimum treatment requirement of settleable solids removal for industrial wastes containing settleable solids. Of course, a higher degree of treatment will be required where the adopted stream standards are not being met. Also as existing primary treatment plants become overloaded or communities become newly sewered, they will be asked to provide secondary treatment (sewage lagoons meet this requirement).

There are 155 public and private sewer systems each treating domestic wastes from over 50 people. There are about 100 industrial waste disposal systems other than those discharging to municipal sewerage systems. Letters have been sent to those that apparently will not meet the proposed stream standards. The request for new, additional, improved treatment, better operation of existing facilities, or separation of storm and sanitary sewers is broken down as follows: (number indicates number of letters sent)

Domestic sewage:

1. Better operation of existing facilities - 4.
2. Disinfection in addition to existing facilities - 3.
3. Secondary treatment in addition to primary treatment presently provided - 5.
4. New treatment facilities - 18.
5. Removal of storm sewers (from the sanitary sewer system) and/or reduction of sewer infiltration water. - 6.

Industrial wastes:

1. Additional treatment facilities - 12.
2. New treatment facilities - 6.

Another 15 systems need additional checking before their adequacy can be determined. The schedules submitted by the industries and communities will be reviewed by the State Water Pollution Control Council to determine if they will comply with the State Plan. In cases that the time of completion proposed is too great, an acceptable schedule will be worked out with the municipality or industry involved. In practically all instances (storm sewers are an exception), a maximum of five years is contemplated for complying with the standards and in

many cases, an even shorter period for compliance is being requested. When schedules have been approved by the Water Pollution Control Council and these schedules are not being met, the needed enforcement action, as set forth in the Montana water pollution law, will be taken to assure compliance.

MONITORING

Municipalities and industries which are contributing or have the potential to contribute large amounts of waste in proportion to the stream flow are being asked to aid in a monitoring program to assure that stream standards are being met. Several have contributed in the past by monitoring their plant wastes. A receiving water monitoring program will be designed and operated as funds and personnel are provided. For now, the present State monitoring program along with the Federal Water Pollution Control Administration monitoring stations already established or proposed will have to suffice until the Montana Legislature sees fit to allocate funds for expanding the program.

SPECIAL PROBLEM WASTES

Mention has been made several times to wastes which are not amenable to conventional treatment methods. Among these wastes are irrigation return flows, runoff from over-grazed lands or over-logged water sheds, drainage and acid mine wastes.

Irrigation return flows are frequently high in silt, soil minerals, nutrients from fertilizers and may include some pesticides or pesticide metabolites. The latter, if of organo-phosphate origin, can contribute to the enrichment problems in surface waters leading to nuisance aquatic growths and unpalatable water for drinking purposes.

Basic to the control of the irrigation return flow problem is more efficient utilization of the available irrigation water supply. This would tend to correct the problem at the source since the quantity of return flows would be greatly reduced.

The Federal Water Pollution Control Administration has given much consideration to the problem of irrigation return flows and this can be summarized from a paper of Mr. Frank DeLuzio, presented at the 19th annual Upper Missouri River Water Users Association meeting in Billings, Montana, December 15, 1966, as follows:

1. Better land and water management practices (spray irrigation).

2. Stream flow regulation for water quality control. It was indicated that low flow augmentation could not be used as a substitute for waste treatment, but that it could be used in areas where waste water treatment alone could not solve the problem. It was also indicated that Bureau of Reclamation and similar feasibility studies for proposed dam sites could include low flow augmentation as part of their economic justification.

3. More complete consideration of water quality in basin and project planning.

4. Better control during project construction.

5. Development of irrigation water treatment and water reuse practices.

It is believed that the same approach can be used by other Federal and State agencies, and private water development groups.

Further attestation to the concern of the Bureau of Reclamation is outlined in an April 9, 1967, release of the Bureau of Reclamation as follows:

"The Department of the Interior today reported that all future repayment contracts between the Bureau of Reclamation and water user organizations will contain uniform articles to combat water pollution on Reclamation projects.

"Commissioner of Reclamation Floyd E. Dominy said the action was taken to help implement the Department of the Interior's nationwide anti-pollution program. 'Secretary Udall has expressed his determination to clean up the Nation's waterways and keep them clean,' Commissioner Dominy said, 'and the Bureau of Reclamation fully supports the effort. We have worked with the Federal Water Pollution Control Administration in spelling out anti-pollution provisions to be included in all our repayment, water service, Small Reclamation Projects, and other types of repayment contracts.'"

"Mr. Dominy said the new contract article is only one phase of Reclamation's continuing program to combat water pollution. Dominy listed other efforts as: the consideration of water quality objectives and pollution control measures in the planning of new projects; expanded research programs to provide new knowledge and tools for increasing the effectiveness of future anti-pollution work; and the adoption of measures to enhance the quality of water on projects now in operation. On existing projects, Dominy said, water quality monitoring systems are being installed and changes of design or operation are being made to improve the quality of return flows and effluents."

As these solutions are developed, it is the intent of the Council to apply them, as feasible, to Montana's return flow problem areas. A recent study by the Montana Fish and Game Department demonstrates the effectiveness of lining irrigation return flow ditches, stream bank fencing for livestock, and stabilizing eroding banks with riprap. These remedial measures were applied to an irrigated area draining to Bluewater Creek near Fromberg and resulted in a dramatic improvement in the trout population of the creek. The rough fish - trout ratio shifted from 4:1 to 1:4 and sediment loadings decreased from 1238 tons per day to 47 tons per day in three years. Of course, the feasibility of applying these measures on a wide scale is a matter of serious contemplation by irrigation water users.

Another major problem involves over-grazing, especially on privately-owned lands. For the most part, land administered for livestock grazing by Federal and State agencies is gradually being

brought under more strict control leading to range improvement and thus, less siltation of surface waters. Poor logging practices and road building in timber harvest areas also leads to heavy siltation of surface waters. Again, governmental agencies are gradually bringing excessive erosion under control; however, private practices continue to be a major problem. It is suggested that governmental agencies responsible for watershed and land use development submit an outline of silt control practices to the Montana Department of Health, Section of Water Pollution Control, for review.

Drainage from abandoned mines and tailings dumps are a perennial problem in Montana mostly stemming from the problem of tracing ownership and the reluctance of owners or leasers to invest money in non-producing speculations. Many of the tailings dumps are frequently located in steep canyons and high-water runoff carries the tailings into surface waters. Many of these dumps are not amenable to correction since, in many cases, little, if any, area is available for new ponding systems. Acid mine drainage presents another dilemma, since this generally requires ponding and pH control. Again, those responsible, even if they can be located, are quite reluctant to install and maintain constant chemical feeding equipment. Abandoned mining and milling areas will continue to present problems; however, as responsibility is placed, applicable control methods will be applied.

COOPERATION WITH ADJACENT STATES AND PROVINCES

The Federal water pollution act calls for close cooperation among the States in developing compatible standards. Preliminary review of adjacent state's water quality criteria has been accomplished and comparison with these proposed standards has been made.

No problem is anticipated with the Canadian provinces, North and South Dakota. Some differences exist between Idaho's and Montana's standards; however, it is anticipated that no major problem exists here. Significant differences exist between Montana and Wyoming's criteria which can only be resolved by conference.

A multitude of streams cross and recross state lines; however, only those waters of a permanent nature are to be considered as interstate streams of significance for purposes of Federal-State cooperation. These waters are shown on Figure 2. Of course, smaller streams which received municipal or industrial treated waste effluents are included.

MONTANA WATER POLLUTION LAW

Section 121. (1) It is the public policy of this state to:

(a) conserve water by protecting, maintaining, and improving the quality and potability of water for public water supplies, wildlife, fish and aquatic life, agriculture, industry, recreation, and other beneficial uses;

(b) provide a comprehensive program for the prevention, abatement, and control of water pollution.

(2) It is not necessary that wastes be treated to a purer condition than the natural condition of the receiving stream. However, municipal or industrial pollution upstream shall not be considered natural.

Section 122. As used in this chapter, unless the context clearly indicates otherwise:

(1) "Sewage" means water-carried waste products from residences, public buildings, institutions, or other buildings including discharge from human beings or animals together with ground water infiltration and surface water present.

(2) "Industrial waste" means any waste substance from the process of business or industry, or from the development of any natural resource together with any sewage that may be present;

(3) "Other wastes" means garbage, municipal refuse, decayed wood, sawdust, shavings, bark, lime, sand, ashes, offal, night soil, oil, tar, chemicals, and all other substances that may pollute state waters;

(4) "Contamination" means impairment of the quality of state waters by sewage, industrial wastes or other wastes creating a hazard to human health;

(5) "Pollution" means the alteration of any of the properties of state waters which is detrimental to their most beneficial use;

(6) "Sewerage system" means any device for collecting or conducting sewage, industrial wastes or other wastes to an ultimate disposal point;

(7) "Treatment works" means any works installed for treating or holding sewage, industrial wastes or other wastes;

(8) "Disposal system" means a system for disposing of sewage, industrial, or other wastes and includes sewerage systems and treatment works;

(9) "State waters" means any body of water, irrigation system, or drainage system either surface or underground;

(10) "Person" means the state, any political subdivision of the state, institution, firm, corporation, partnership, or individual or other entity;

(11) "Council" means the state water pollution control council.

Section 123. Waters shall be classified only for industrial use if primarily and continuously devoted to industrial waste use except for seasonable variations for a period of over thirty (30) years, and not used for human consumption in a single public supply system serving more than one hundred (100) persons.

Section 124. This chapter does not apply to drainage or seepage from artificial, privately owned bodies of water unless drainage reaches flowing waters in a condition which would pollute the flowing waters.

Section 125. Under council supervision, the state board of health has responsibility for administration of the provisions of this chapter. The state board may use personnel of the state department of health as necessary to administer the provisions of this chapter.

Section 126. It is unlawful to:

(1) cause pollution as defined in section 122 (5) of this act to any state waters or to place or cause to be placed any wastes in a location where they are likely to cause pollution of any state waters;

(2) carry on any of the following activities without a current permit from the department:

(a) operate a disposal system which discharges to the state waters;

(b) construct or modify a disposal system which discharges to the state waters;

(c) increase the volume or strength of sewage, industrial wastes, or other wastes in excess of the permissive discharges specified under any existing permit;

(d) construct or use any new outlet for the discharge of sewage, industrial wastes, or other wastes to the state waters.

Section 127. The department may require plans and specifications to determine if a permit should be issued. If a violation of a permit causes damage to a water use, the department may immediately order revocation of the permit without a hearing and so notify the violating person in writing, by registered mail, return requested, the revocation to be effective immediately upon receipt of such notice by such person.

Section 128. (1) The state board shall advise, consult, and cooperate with other states, other state agencies and agencies of the federal government, affected groups, political subdivisions and industries, in the formulation of a comprehensive plan to control water pollution.

(2) The state board may:

(a) accept loans and grants from the federal government and from other sources to carry out the provisions of this chapter;

(b) modify council actions, but only as necessary to protect human health;

(c) through its authorized representatives, enter upon any private or public property at reasonable times to investigate conditions relating to pollution of state waters;

(d) issue, modify, or revoke orders for the abatement of pollution;

(e) issue, revoke, modify, or deny permits to persons for the collection and discharge of sewage and wastes under conditions prescribed by the state board and the council.

Section 129. The department shall:

(1) examine and approve or disapprove plans and other information needed to issue a permit;

(2) collect and furnish information relating to the prevention and control of water pollution;

(3) conduct necessary research and demonstrations concerning water pollution.

Section 130. There is a state water pollution control council whose members are:

(1) the executive officer of the state department of health;

(2) the state fish and game director;

(3) the director of the water conservation board;

(4) four members appointed by the governor for terms of four (4) years as follows:

(a) a representative of industry concerned with the disposal of inorganic waste;

(b) a representative of industry concerned with the disposal of organic waste;

(c) a representative of agriculture;

(d) a representative of municipal government.

Section 131. Terms of council members holding office on the effective date of this act shall not be affected. An appointment to an expired term

shall be for four (4) years. An appointment to an unexpired term shall be for the remainder of the term. The four (4) appointed members shall receive twenty dollars ($20) per day plus actual and necessary expenses incurred in performing their duties. Expenses shall be paid by the department of health from funds appropriated and allocated to water pollution control.

Section 132. (1) The council shall select a chairman from among its members. The executive officer shall designate a member of the public health engineering staff of the department to act as secretary to the council. The secretary shall keep records of all actions taken by the council.

(2) It shall hold at least two (2) regular meetings each calendar year. Special meetings shall be held at the call of the chairman or upon written request of two (2) or more members. A majority of the members is a quorum.

(3) Each member may, by filing with the secretary, designate a deputy or alternate to perform his duties.

Section 133. The council shall:

(1) establish and modify the classification of all waters in accordance with their present and future most beneficial uses;

(2) investigate means of eliminating materials which pollute state waters, and prevent pollution that is detrimental to the public health, recreation, agriculture, industry, animals, fish, or aquatic life;

(3) adopt rules to guide the state board and department in the administration of this act;

(4) adopt a comprehensive program for prevention of pollution of waters;

(5) recommend and encourage research and demonstrations relating to water pollution;

(6) direct the state board and department regarding any action necessary as a result of research or demonstrations;

(7) formulate standards of water purity and classification of water according to its most beneficial use giving consideration to the economics of waste treatment and prevention;

(8) hold any hearings necessary for the proper administration of this act, receive complaints, and make investigations;

(9) utilize staff service of the state board and department as they are able to furnish within budgetary limits;

(10) exercise all incidental powers necessary to carry out the provisions of this chapter.

Section 134. Before streams are classified, or standards established or modified, the council shall hold a public hearing. Notice of the hearing specifying the waters concerned and the classification, standard or modification of them shall be published at least once a week for three (3) consecutive weeks in a newspaper of general circulation in the area affected. Notice shall also be mailed directly to persons the council believes may be affected by the classification or standard.

Section 135. Any order of the council or state board is final thirty (30) days after notice is given to the person affected unless a rehearing is held before that time. The procedure for a rehearing is:

(1) the person affected by the order shall request a rehearing before the council;

(2) before the thirty-first day after receipt of the request, the council shall hold a rehearing;

(3) a record or summary of the rehearing shall be filed with the council together with its findings of fact;

(4) a representative of the council may administer oaths, examine witnesses, and issue notices of the rehearing including subpoenas requiring the testimony of witnesses and the production of evidence;

(5) witnesses shall receive the same fees and mileage as in other civil actions;

(6) in case of failure to obey a notice of hearing or subpoena, the district court where the hearing is held has jurisdiction upon request of the council to issue an order requiring a person to appear and testify or produce evidence, and failure to obey shall be punished as contempt of district court;

(7) the council shall affirm, modify, or reverse the order of the council or the board and notify the person of its action;

(8) the order of the council or the state board is final thirty (30) days after notice of final action is served on the person by registered mail unless the person has appealed to the district court.

Section 136. The procedure for appealing the decision of the council at a rehearing is:

(1) within thirty (30) days after the receipt of a copy of the council's decision, a person shall serve notice of appeal on the council through its secretary;

(2) for good cause, the court may extend the time for notice of appeal but not to exceed an additional sixty (60) days;

(3) the notice of appeal shall refer to the action and specify the ground of appeal;

(4) the notice of appeal with proof of service shall be filed with the clerk of the court before the eleventh day after service of the notice;

(5) any person affected may become a party by intervention as in a civil action upon showing cause;

(6) the attorney general shall represent the council if requested, or the council may appoint special counsel for the proceedings;

(7) no bond or deposit for cost is required of the state or council upon the appeal to the district court or any subsequent appeal;

(8) the trial shall be de novo;

(9) the court shall determine whether or not the council regularly pursued its authority, or whether the orders of the board and the findings of the council are sustained; and whether the orders and findings are reasonable under the circumstances of the case;

(10) an appeal from the decision of the district court may be made to the supreme court in the same manner provided in other civil cases;

(11) upon final determination, the council shall enter an order in accordance with the determination made by the court.

Section 137. Before the thirty-first day after an order of the state board or the council becomes final, or a court judgment affirming or reversing the order is entered, the person upon whom the order was served shall initiate steps to comply with the order. On good cause shown, the state board or council may extend the period for compliance for a reasonable time.

Section 138. The council shall bring action for an injunction against any person who fails to comply with a final order of the state board or council.

Section 139. The council may require the assistance, cooperation, services, and use of records of all state agencies. State officers and employees shall cooperate with the council in furthering the purposes of this chapter.